POROUS IMPLANT WITH NON-POROUS THREADS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of, and claims priority to, U.S. patent application Ser. No. 12/167,107 filed Jul. 2, 2008, entitled "POROUS IMPLANT WITH NON-POROUS THREADS," the specification of which is herein incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to bone implants and, in particular, to a threaded dental implant with improved osseointegration.

2. Description of the Related Art

Dental implants are commonly used as anchoring members for dental restorations to provide prosthetic teeth at one or more edentulous sites in a patient's dentition at which the patient's original teeth have been lost or damaged. Typically, implant systems can include a dental implant made from a suitable biocompatible material, such as titanium. The dental implant can be threaded into a bore, which is drilled into the patient's mandible or maxilla at the edentulous site. The implant provides an anchoring member for a dental abutment, which, in turn, provides an interface between the implant and a dental restoration. The restoration can be a porcelain crown fashioned according to known methods.

Many current dental implant surgeries are performed in two stages. In the initial or first stage, an incision is made in the patient's gingiva at an edentulous side, and a bore is drilled into the patient's mandible or maxilla at the edentulous site, followed by threading or impacting a dental implant into the bore using a suitable driver. Thereafter, a cap is fitted onto the implant to close the abutment coupling structure of the implant, and the gingiva is sutured over the implant. Over a period of several months, the patient's jaw bone grows around the implant to securely anchor the implant in the surrounding bone, a process known as osseointegration.

In a second stage of the procedure following osseointegration, the dentist reopens the gingiva at the implant site and secures an abutment and optionally, a temporary prosthesis or temporary healing member, to the implant. Then, a suitable permanent prosthesis or crown is fashioned, such as from one or more impressions taken of the abutment and the surrounding gingival tissue and dentition. In this final stage, the temporary prosthesis or healing member is removed and replaced with the permanent prosthesis, which is attached to the abutment with cement or with a fastener, for example. Alternative single stage implants with integral emergence profiles or one-piece implants with integral abutments may be used that extend through the transgingival layer so that the gingiva need not be reopened to access the implant.

Patients prefer to leave after initial surgery with some type of restoration and studies indicate that healing of both soft and hard tissue may be improved if the implant is loaded after surgery. Post-surgical loading, even if less than a full load of occlusion, however, is sufficient to displace the implant. Thus, threads may be used to secure the implant directly to the bone to achieve initial stability.

SUMMARY

The present inventors have recognized, among other things, that a dental implant can become displaced due to improper in-growth of dental bone into the dental implant. In such instances, the dental implant can become displaced during tensile and compressive forces or bending and twisting forces generated during a chewing motion.

One way to improve osseointegration onto an implant, and in turn improve the long term stability of the implant, is to provide a porous material on the implant that the bone can grow into. Such a porous material can also increase short term stability for immediate loading due to a large friction coefficient with surrounding bone.

Providing a porous material only on the surface of the implant, however, can result in bone growth only near the surface of the implant. The final stability of the implant can be increased if bone growth extends deeper than just near the surface of the implant. Such a porous structure, however, may not provide sufficient strength to use as threads on a screw-type implant to resist mastication forces. The present inventors have thus conceived a porous implant configuration that provides sufficient initial and long-term stability when embedded in biological tissue, such as bone.

To better illustrate the porous implants with non-porous threads and related methods disclosed herein, a non-limiting list of examples is provided here:

In Example 1, a dental implant comprises a shaft defining a longitudinal axis and having an apical end, a coronal end, and an exterior surface, a portion of the exterior surface including a porous material; and at least one thread, including a non-porous material, having an interior surface and a bone-engaging surface, the interior surface engaging and winding around the exterior surface of the shaft, the bone-engaging surface extending outwardly from the exterior surface of the shaft.

In Example 2, the dental implant of Example 1 optionally further comprises a non-porous head portion, including a male or female interface for coupling to an abutment, positioned at the coronal end of the shaft.

In Example 3, the dental implant of Example 2 is optionally configured such that the coronal end of the shaft includes a coronally accessible cavity configured for receiving and coupling to the head portion.

In Example 4, the dental implant of any one or any combination of Examples 2 and 3 is optionally configured such that the at least one thread is integrally formed with the head portion.

In Example 5, the dental implant of any one or any combination of Examples 2-4 is optionally configured such that the at least one thread includes a plurality of helical parallel threads, each thread winding apically away from the head portion and concentric about the longitudinal axis.

In Example 6, the dental implant of any one or any combination of Examples 1-5 is optionally configured such that the interior surface of the at least one thread defines a central opening configured to receive and engage at least the coronal end of the shaft.

In Example 7, the dental implant of any one or any combination of Examples 1-6 is optionally configured such that the exterior surface includes a groove for receiving a portion of the at least one thread.

In Example 8, the dental implant of any one or any combination of Examples 1-7 is optionally configured such that the shaft includes one or more channels configured to communicate a flowable material, stored within the shaft, to the exterior surface, each channel including an opening at the exterior surface.